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DECNET AND THE HIGH ENERGY PHYSICS NETWORK*

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and the

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SUMMARY

The High Energy Physics community requires DECnet area numbers 41, 42, and 43 for its needs in physics research. In order avoid conflicts in node identification we need your assistance and cooperation. A discussion and rationale for this requirement follows.

DISCUSSION

Over the last 5 years there has been a growing need for High Energy Physics (HEP) experimenters and theorists to interact and collaborate. For this purpose, university HEP departments have been installing computer networking circuits and facilities between each other and the major HEP laboratories across the country. This networking need has grown as the size and scope of physics experiments have grown. It is not unusual to have an experiment that involves a dozen different universities and laboratories located across the U.S., Europe, and Japan. This diversity of geography and the need for coordination among all parties has created the need for HEPnet.

DEC VAX systems have become very popular in the HEP community. Most of the university HEP departments own or have access to a VAX system. Additionally many experiments have VAX systems that are used in the actual experiment in an on-line sense. Some future proposed experiments consist of a hierarchy of VAX systems starting out with banks of MicroVAX'es networked to larger VAX systems. The utility of having the university VAX networked directly to the experimental VAX is obvious. HEPnet's role is to provide the backbone carrier for multiple uses and protocols. DECnet's role is to serve as one of the major protocols that will be carried and distributed through HEPnet.

Currently many university HEP VAX'es have been DECnet'ed together on a cooperative basis to form an effective informal network, dubbed "PHYSnet". PHYSnet consists primarily of leased 9600 baud circuits linking approximately 50 locations and 300 nodes across the country. PHYSnet thus exists as a functional homogenuous network (utilizing DECnet) within a logical hetergenous network called HEPnet.

The current topology of PHYSnet reflects the manner in which HEP research is conducted in this country. Major universities active in HEP research typically conduct experiments at large research facilities constructed solely for that purpose. This allows numerous experiments to share the same particle

accelerator facilities, permitting research that would otherwise be prohibitively expensive. The flow of data between physics departments at those universities and their experimental sites thus tend to "hub" at the major research facilities where those experiments are located.

The present PHYSnet contains two "hubs". One is Fermi National Accelerator Laboratory (FNAL) and neighboring Argonne National Laboratory, both located just west of Chicago, Ill. The two laboratories are connected by a high capacity microwave link, and for purposes of PHYSnet, may be viewed as one hub. The second hub is the Stanford Linear Accelerator (SLAC) and the University of California Lawrence Berkeley Laboratory (LBL), both situated in the San Francisco Bay area. As before, the facilities are connected by a high capacity microwave link, and may conceptually be viewed as a single hub. The two hubs are linked, creating what one might classify as a dual-star topology for the network. A third high energy facility, Brookhaven National Laboratory (Long Island, N.Y.) will shortly be connected to FNAL, effectively forming a third hub with an additional 20 - 30 nodes.

The existing 300 node PHYSnet is presently defined as one area with default address of area 1. Although the present allocation of nodes represents only one-third of the area capacity, several factors support the move to multiple areas within the immediate future. First, given the limit of 1023 nodes per area, the move to a multiple area network appears to be inevitable. Projecting node expansion based on past PHYSnet growth alone leads one to that conclusion. DEC's introduction of the MicroVAX II (and forthcoming MicroVAX III) intensifies that pressure for nodal expansion. Future on-line experiments are expected to utilize large numbers of these relatively low cost supermicros. Once the necessity for a multi-area network is recognized, the desirability of splitting the network as soon as possible is apparent. The transition from a single area network to a multiple area network would undoubtedly be easier with a 300 node network than with a network two or three times as large. Another factor to consider is the desirability of early establishment of PHYSnet's area designations. PHYSnet would then be in a more effective position to establish its area number designations in the world of scientific research, discouraging others from adopting the same numbers, and reducing the potential for future area number conflict.

Recently, a conference of the computer network departments for the "hub" facilities assembled for the purpose of addressing the issue of area routing within PHYSnet. The conference agreed that a transition to a multiple area network was both timely and in the best interests of the PHYSnet network. The principal discussions involved the practical facets of that transition. It was decided that the generalized structure of the multiple area PHYSnet would be a three area network, with the two major hubs of the existing PHYSnet (FNAL/Argonne and SLAC/LBL) each being assigned a specific area designation, and Brookhaven serving as a third hub with its own area. Individual facilities within the present PHYSnet would adopt the area address of the hub to which they presently connect (area designation represents logical connection, not geographical location). Existing node numbers and names will remain unchanged with the exception of the new area designation.

Discussion was given to "reserving" one or more area numbers for future use either by the European and/or Japanese physics communities, or to be held in reserve for future needs. It was decided that it would be impractical to reserve but not utilize an area number. European and/or Japanese area

designations would be addressed as they became necessary. Furthermore, the need for reserving area numbers for future use will hopefully be alleviated by the anticipated expansion of area numbers from 63 (current) to 255 or more.

One potential problem is the desire voiced by several large universities to have their own area designation, and still remain linked to PHYSnet. It is anticipated that this desire for personalized areas and PHYSnet links will spread to most of the major universities engaged in HEP research. This creates several problems for PHYSnet. First, there presently exists only 63 area numbers. As the number of universities arbitrarily designating themselves to be areas increases, so does the probability of a conflict between area/node numbers. Furthermore, other nodes within a given university network may access other networks (ie. the Chemistry VAX accessing CHEMnet), thus compounding the probability of such conflicts. This would create strong possibilities for traffic being partially or wholly misrouted and/or lost. Second, the problems of network security/integrity increase sharply if PHYSnet becomes accessible to university-wide networks. As a result of these anticipated problems, it was decided that PHYSnet should strive to maintain its homogeneity. Universities desiring to access PHYSnet will be required to utilize a PHYSnet-assigned node name and address (including appropriate PHYSnet area number) to connect to the network. If they choose to designate their own university-wide area, the cost of transmission between the PHYSnet area and the university area will have to be set to preclude transmissions either into or out of the PHYSnet network. This will provide at least some level of isolation.

The area designations for PHYSnet are listed below:

SLAC/LBL	41
FNAL/ANL	42
Brookhaven	43

Conflicts with other network area numbers will be increasingly difficult to avoid as the use of areas grow. For that reason, it is highly advisable that DECnet networks having contact with scientific research facilities and research oriented university environments avoid these numbers when selecting area numbers. In that manner, conflicts resulting from duplicate area addresses can be minimized.